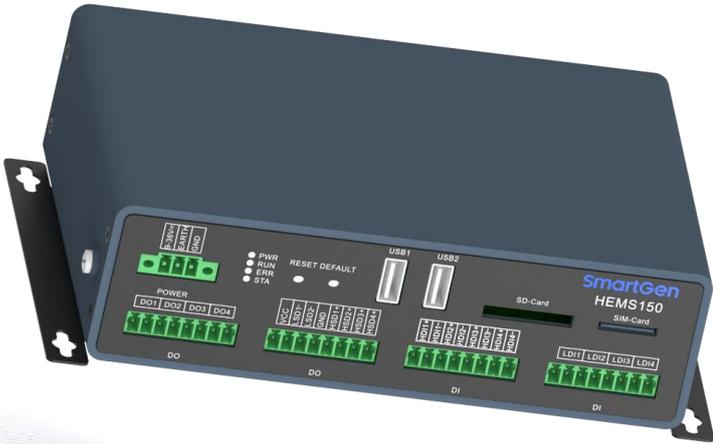


# SmartGen

MAKING CONTROL SMARTER

## HEMS150 MICRO-GRID CONTROLLER USER MANUAL



郑州众智科技股份有限公司  
SMARTGEN(ZHENGZHOU)TECHNOLOGY CO.,LTD.

## SmartGen<sup>Registered trademark</sup>

No.28 Xuemei Street, Zhengzhou, Henan, China

Tel: +86-371-67988888/67981888/67992951

+86-371-67981000(overseas)

Fax: +86-371-67992952

Web: [www.smartgen.com.cn/](http://www.smartgen.com.cn/)

[www.smartgen.cn/](http://www.smartgen.cn/)

Email: [sales@smartgen.cn](mailto:sales@smartgen.cn)

All rights reserved. No part of this publication may be reproduced in any material form (including photocopying or storing in any medium by electronic means or other) without the written permission of the copyright holder.

SmartGen reserves the right to change the contents of this document without prior notice.

**Table 1 Software Version**

Date	Version	Note
2024-12-10	1.0	Original release.

Table 2 Symbol Instruction

Symbol	Instruction
 NOTE	Highlights an essential element of a procedure to ensure correctness.
 CAUTION	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.

SmartGen

## CONTENTS

1 OVERVIEW .....	6
2 PERFORMANCE AND CHARACTERISTICS .....	6
3 SPECIFICATION .....	8
4 MICROGRID SYSTEM .....	9
5 PRODUCT FUNCTION.....	10
5.1 EQUIPMENT MANAGEMENT AND MAINTENANCE.....	10
5.2 CONTROL AND PROTECTION .....	10
5.3 SITE MANAGEMENT AND MAINTENANCE.....	10
6 CONTROL STRATEGY .....	10
6.1 COUNTERCURRENT PROTECTION .....	10
6.2 OVERLOAD PROTECTION.....	10
6.3 DEMAND CONTROL .....	11
6.4 DEMAND SIDE RESPONSE.....	11
6.5 GREEN POWER UTILIZATION.....	11
6.6 FLEXIBLE EXPANSION .....	11
6.7 LOAD FOLLOW.....	11
6.8 LOAD FORECAST.....	11
6.9 GENERATION FORECAST .....	11
7 MICRO-GRID SYSTEM MODE.....	12
7.1 ILLUSTRATION .....	12
7.2 MAINS POWER + PV + ENERGY STORAGE (PEAK LOAD SHIFTING) .....	12
7.3 PV + ENERGY STORAGE (ISLAND MODE) .....	12
7.4 DIESEL GENSET + PV +ENERGY STORAGE (ISLAND MODE).....	12
8 SYSTEM LOAD DISTRIBUTION .....	14
9 TYPICAL APPLICATION .....	15
10 CLOUD PLATFORM .....	15
11 TERMINAL DEFINITION .....	16
11.1 POWER INTERFACE.....	16
11.2 DO INTERFACE.....	16
11.3 DI INTERFACE.....	17
11.4 CAN INTERFACE .....	18
11.5 RS-485 INTERFACE.....	19
11.6 RS-232 DEBUGGING INTERFACE .....	19
11.7 ETHERNET INTERFACE .....	19
11.8 KEY .....	20
11.9 USB DOUBLE-LAYER SOCKET .....	20
11.10 SIM CARD SOCKET .....	20
11.11 SD CARD SOCKET .....	20
11.12 ANTENNA INTERFACE .....	20
11.13 miniPCIE INTERFACE.....	21
11.14 INDICATORS.....	21
11.15 OVERALL AND INSTALLATION DIMENSIONS.....	22
12 COMMISSIONING.....	23

SmartGen

## 1 OVERVIEW

**HEMS150 Micro-Grid Controller** is developed based on Linux operation system that can make the power system work in intelligent and high efficiency way and expand intelligent components to realize more functions. The product can provide more powerful, user-friendly and convenient interface, support the management and real-time communication of PCS, rectifier, solar module, wind power module, inverter module, DC/DC module, diesel genset, lead-acid/lithium battery, liquid cooling/air conditioner, intelligent breaker, ATS, AC energy meter, DC energy meter, collect important data of all communication substations, then control the whole system to operate orderly and reliably through the data acquisition, processing, analysis and logical operation of internal program. It can be widely applied for communication, energy, industrial park, communication base station of data center, port, shopping mall, finance, transportation, hotel, industrial and mining area, oil field, medical field, organs, school, military industry and other fields.

## 2 PERFORMANCE AND CHARACTERISTICS

- Equipment management;
- Battery management;
- Peak load shifting of industrial and commercial energy storage;
- Energy storage control (countercurrent protection, demand control, demand side response, load follow, green power utilization, etc.);
- Industrial and commercial energy storage control;
- Industrial and commercial energy storage + PV control;
- PV + energy storage control;
- Energy storage + diesel genset control;
- PV + diesel genset control;
- PV + energy storage + diesel genset control;
- PV + energy storage + charging pile control;
- Mains power + energy storage control;
- Mains power + PV control;
- Mains power + diesel genset control;
- Mains power + energy storage + PV control;
- Mains power + energy storage + PV + diesel genset control;
- Realize SOC balance between battery clusters;
- Correct SOC through full charging of the battery cluster;

- Fault alarm and protection;
- Support cloud platform;
- With monitoring and management, “three remote” (remote control, remote measurement, remote communication) function;
- Multicast technology realizes master-slave unified scheduling of multiple EMS network;
- Support NTP timing;
- Support cloud upgrade of application program.

SmartGen

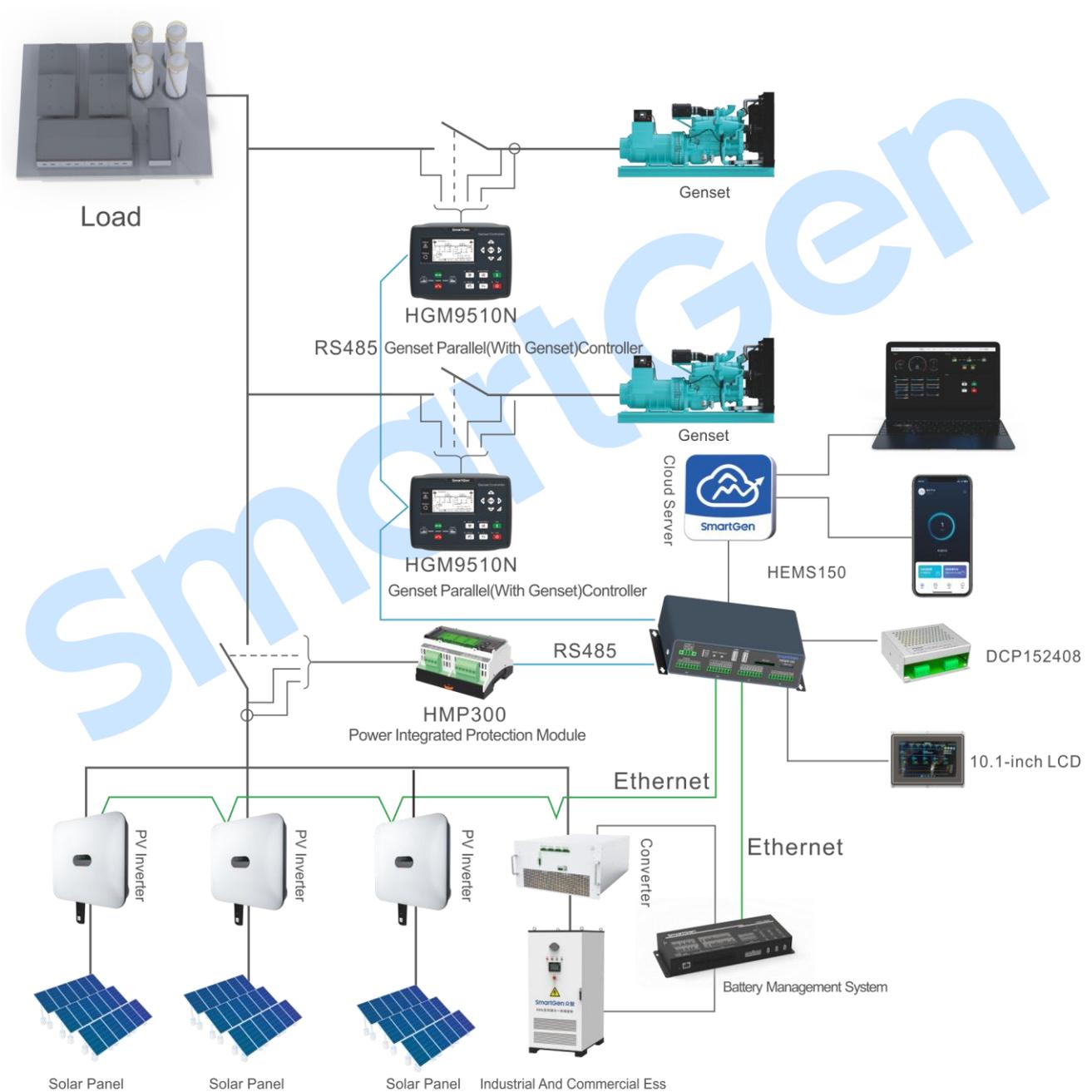
3 SPECIFICATION

Table 3 Parameter Comparison

Item	HEMS100	HEMS150	HEMS200
Working Voltage	DC12V/DC24V	DC9~36V	DC12V/DC24V
Overall Consumption	<4W	<9W	<12W
Processor	792MHz single-core Cortex® A7	1.2GHz dual-core Cortex®-A55+200MHz single-core Cortex®-M33	Multi-core 1.1GHz Cortex® A53
Memory	DDR3 512MB	DDR4 1GB	DDR3L 2GB
Storage	eMMC 4GB	eMMC 8GB	eMMC 8GB (can expand M.2 SSD externally)
Operation System	Linux	Linux	Linux
ADC	(0-20)mA, (0-10)V, 1%, 40sps sampling rate	/	(0-20)mA, (0-10)V, 1%, 40sps sampling rate
CAN	Isolation	Isolation	Isolation
RS485	Isolation	Isolation	Isolation
DI	8	8	18
DO	14	12	8
ADC	4	/	4
ETHERNET	2	2	4
RS232	1	2/1	3
RS485	4	5/6	8
CAN	3	2	3
USB	2	2	2
4G Module	•	•	•
Wi-Fi Module	•	•	•
RTC	•	•	•
NTP	•	•	•
M.2 (SSD)	/	/	•
TF Card	•	•	•
IEC61850	•	•	•
IEC104	•	•	•
DLT645	•	•	•
Modbus-TCP	•	•	•
Modbus-RTU	•	•	•
Industrial and Commercial Energy Storage	•	•	•
PV + Energy Storage	•	•	•
PV + Energy Storage + Diesel Genset	•	•	•
PV + Energy Storage + Charging Pile	•	•	•

Item	HEMS100	HEMS150	HEMS200
Cloud Platform	●	●	●
Overall Dimension	190mmx115mmx52.4 mm	190mmx115mmx52.4 mm	232mmx113mmx59mm
Working Temperature	(-40~+60)°C	(-40~+70)°C	(-40~+60)°C
Working Humidity	(5~95)%RH		
LCD	/	Power supply: DC12V/24V; dimension: 10.1-inch; pixel: 1280*800	

## 4 MICROGRID SYSTEM



**Fig.1 Microgrid System**

## 5 PRODUCT FUNCTION

### 5.1 EQUIPMENT MANAGEMENT AND MAINTENANCE

It can collect data of PCS, PV, genset, BMS (including cell data), energy meter, load, dynamic environment, air conditioner, firefighting, safety supervision, etc. accurately, comprehensively via various communication methods (Ethernet, RS485, CAN, etc.) in real time. The collected original data of the equipment is stored, the stored information includes remote measurement data, remote communication data, alarm information, operation log, events, etc. These stored data can be exported. The collected real-time, historical data of the equipment is transformed and processed in combination with parameters and control logic set by EMS system, then display data, statistic and alarm information are generated and reported to cloud platform of EMS system in real time. The controller can remotely control, configure, and conduct maintenance, then make remote control, parameter setting, debugging, upgrade and other operations for PCS, BMS, PV, genset, dynamic environment, air conditioner, safety supervision, etc.

### 5.2 CONTROL AND PROTECTION

- Support linkage protection of firefighting system and energy storage system, and customized control logic.
- Support linkage protection of PCS and BMS, and customized control logic.
- Support PV generation protection, and customized control logic.
- Support genset protection, and customized control logic.
- Support linkage protection of other auxiliary system and energy storage system, and customized control logic.

### 5.3 SITE MANAGEMENT AND MAINTENANCE

- Support energy storage site system monitoring, energy scheduling, equipment management, running maintenance, data analysis and other functions of cloud platform.
- Support boot exclusive system, local touch control, user interaction, which is simple and convenient.
- Support site equipment configuration and data monitoring.

## 6 CONTROL STRATEGY

### 6.1 COUNTERCURRENT PROTECTION

This strategy prevents reverse power flow to the grid through software-based controls. For critical protection, a reverse-power protection device can be added to trip the circuit immediately upon detecting backflow. The system integrates real-time power data from the transformer's low-voltage side meter. If reverse power exceeds the set limit, the system automatically reduces or halts energy storage discharge. The recommended reverse power limit is calculated as the transformer's maximum capacity multiplied by the power factor(5%-10%). The protection action is triggered after a 5-10 second delay.

### 6.2 OVERLOAD PROTECTION

It can prevent transformer capacity excess when energy storage is charging through the software.

## **6.3 DEMAND CONTROL**

Grid tariffs consist of a fixed capacity charge (transformer capacity fee) and variable energy charges. The capacity fee is declared in advance, with excess usage incurring doubled fees. To minimize these costs, peak demand must be reduced to avoid exceeding the declared capacity. This strategy requires real-time power data from the transformer's low-voltage side meter. When power exceeds predefined thresholds, the system automatically activates or increases energy storage discharge. The demand limit is defined by active power (kW), calculated as the transformer's maximum capacity (kVA) multiplied by the power factor.

## **6.4 DEMAND SIDE RESPONSE**

Power consumers submit demand-side response requests through the designated system. Once approved, the request enters the execution phase. The declared response load must not exceed the contract capacity and should ideally remain below the baseline average load. On the response execution day, the system adjusts the energy storage system's charging/discharging operations based on predefined time windows and load conditions to fulfill the response commitment.

## **6.5 GREEN POWER UTILIZATION**

Green power utilization refers to PV generation utilization, that is, the surplus electric energy emitted by PV is dispatched to the load point with energy demand. In this system, when PV generation exceeds local load requirements, the excess energy charges the storage system. Once the energy storage is fully charged, additional PV power is fed into the grid for utilization.

## **6.6 FLEXIBLE EXPANSION**

When the power consumption is greater than the transformer capacity in a short time, the energy storage is discharged quickly to meet the requirements of load energy consumption.

## **6.7 LOAD FOLLOW**

The system can track the load power consumption in real time, and schedule PV generation, energy storage generation, oil engine generation and other generation equipment reasonably and efficiently according to load power consumption.

## **6.8 LOAD FORECAST**

Energy storage load forecasting analyzes historical data, real-time data, and external influencing factors using mathematical models and algorithms to predict future storage loads over a defined period. The forecast results provide a decision-making basis for charging/discharging strategies, enabling optimized system operation and maximizing economic benefits.

## **6.9 GENERATION FORECAST**

The system utilizes meteorological bureau forecasts, historical weather data, and past power generation records to predict short-term or ultra-short-term wind and solar power output. These forecasts enable optimized energy dispatch, maximizing the economic and social benefits of distributed generation while improving microgrid reliability and economy.

## 7 MICRO-GRID SYSTEM MODE

### 7.1 ILLUSTRATION

There are two operation modes for this system. If mains power is normal, it will enter “mains power + PV + energy storage” mode; if mains power is abnormal, it will enter diesel genset + PV + energy storage” mode. Mains power, energy storage or genset must be kept online to stabilize AC busbar frequency and voltage, while the PV system operates in current source mode to synchronize with the active power source.

### 7.2 MAINS POWER + PV + ENERGY STORAGE (PEAK LOAD SHIFTING)

When mains power is stable, the EMS closes the mains circuit breaker and activates PV inverters. The power meter monitors real-time mains input to limit PV output, ensuring maximum solar utilization while preventing reverse power flow to the grid. The energy storage system charges or discharges according to predefined schedules to achieve peak load shifting and peak-valley arbitrage.

### 7.3 PV + ENERGY STORAGE (ISLAND MODE)

When mains power is abnormal, the EMS opens the mains circuit breaker. Upon grid disconnection, the energy storage system operates in different modes depending on its configuration.

**Mode1:** If the Power Conversion System (PCS) supports Virtual Synchronous Generator (VSG) function, the PCS assumes the entire load after grid disconnection. As long as the load remains within the PCS's rated capacity, the AC busbar remains energized without interruption.

**Mode2:** If a static transfer switch (STS) is installed between the mains power and PCS, or the PCS incorporates fast mode-switching capability, the STS immediately isolates the grid upon failure. If the STS can command the PCS to enter off-grid mode, the PCS remains operation without tripping due to undervoltage protection in grid-connected mode. Certain PCS brands automatically detect grid loss and switch to Voltage/Frequency (VF) control mode, or utilize external digital signals for mode transition. STS switching times vary by manufacturer but typically operate at millisecond-level speeds.

**Mode3:** During the mains power failure, the PCS initiates a self-protection shutdown due to AC busbar undervoltage. After the mains breaker is opened, the EMS switches the PCS to VF or VSG mode and restarts it.

**Mode4:** The mains power is DC-coupled to the energy storage system's high-voltage DC bus. When mains failure occurs, it will trigger the mains-side AC/DC inverter to shut down via self-protection due to AC busbar undervoltage. The DC bus continues to supply power from the energy storage, ensuring uninterrupted operation of the load-side PCS and AC load bus. If an AC busbar blackout occurs during this process, the photovoltaic (PV) system automatically shuts down due to undervoltage protection. The EMS reactivates the PV system once the AC busbar voltage stabilizes.

The load distribution of PV + energy storage in island mode is as follows:

**Mode1:** The PV system supplies the entire plant load. Excess PV power charges the energy storage until the battery's State of Charge (SOC) reaches the upper limit defined by the EMS.

**Mode2:** If the PV system cannot fully meet the plant load, it operates at maximum available capacity, while the energy storage discharges to supply the remaining load until the battery's SOC reaches the lower discharge limit set by the EMS.

### 7.4 DIESEL GENSET + PV + ENERGY STORAGE (ISLAND MODE)

Under island mode operation, the generator typically remains inactive until any of the following conditions triggers its startup:

**Condition1:** Photovoltaic (PV) and energy storage systems (ESS) cannot meet load demand requirements.

**Condition2:** Significant short-term power fluctuations in PV output caused by overcast weather conditions jeopardize system operational safety.

**Condition3:** Battery state of charge (SOC) drops below the threshold and is not suitable as the sole online power source.

Following generator running, the system must verify synchronization conditions before closing the generator circuit breaker. This synchronization function shall be executed by the generator controller. If the generator controller lacks synchronization capability, or if the system contains asynchronous closing devices such as automatic transfer switches (ATS), an independent synchronization device must be implemented.

Depending on system architecture, the energy storage system (ESS) adopts distinct operation modes when integrating a generator, as follows:

**Mode1:** If the PCS is equipped with VSG function, the PCS maintains its current operating mode without requiring mode switching upon generator connection.

**Mode2:** If a STS is installed, the STS detects synchronization conditions before closing when the generator is connected. Concurrently, the STS issues a PQ mode command to the PCS, triggering PCS restart in PQ mode. The STS closing sequence varies across manufacturers. Certain STS units lack synchronization capability, requiring the PCS to shut down prior to STS engagement.

**Mode3:** For PCS units without VSG or STS function, the PCS initiates a self-protection shutdown due to concurrent voltage source conflicts when the generator is activated. The EMS subsequently restarts the PCS in PQ mode.

In the event of an AC bus blackout during operation, the PV system will automatically shut down through its under-voltage protection mechanism. Following AC bus voltage restoration, the EMS controls the PV system to restart. To prevent load-side power interruptions caused by generator connection/disconnection cycles, and in compliance with PCS architectures incompatible with frequent generator cycling, generator starts and keeps running during mains power failure.

The following operation modes govern load allocation in DG-PV-ESS systems under island conditions:

**Mode1:** To minimize DG fuel consumption rates, the DG operates at its minimum load threshold whenever system load permits.

**Mode2:** The DG shall not charge the ESS under normal operating conditions, except when:

- System load falls below the DG's minimum load operation criteria;
- Minimum load charging function is explicitly enabled.

**Mode3:** Under the DG minimum load constraint, the PV system shall maximize power generation. Excess PV output charges the ESS until the SOC reaches the limit configured in the EMS.

**Mode4:** For insufficient PV generation scenarios:

1. The DG or ESS compensates for power deficits.
2. When ESS holds higher configurable load priority than the DG (subject to adequate SOC):
  - DG operates at minimum load threshold;
  - PV generates at maximum available capacity;
  - ESS supplies residual power demand.

**Mode5:** When PV generation is insufficient and either:

- Battery SOC falls below operation thresholds, or
- The ESS is assigned lower load priority than the generator (configurable),

the system shall execute the following sequence:

1. PV operates at maximum available generation capacity;
2. The generator assumes priority in supplying residual load demand;
3. The ESS automatically regulates output to maintain generator operation within its fuel-optimized power point.

The generator may be decommissioned only when all the following conditions are satisfied concurrently:

**Condition1:** System load has reached the preconfigured automatic shutdown limit.

**Condition2:** The available power of the system is sufficient to bear the risk of a sharp drop in PV output in a short period of time during cloudy weather.

**Condition3:** The battery SOC is high enough to be the only online voltage source in the system.

## 8 SYSTEM LOAD DISTRIBUTION

Load distribution among multiple energy storage systems: The EMS ensures balanced load distribution across multiple ESS. To prevent energy loss during power transfer between storage units with differing SOC, the EMS avoids charging from higher SOC units to lower SOC units. For SOC balancing, when the system requires ESS charging, the EMS prioritizes SOC-based strategy, the system directs charging to storage units with lower SOC and discharging from units with higher SOC to achieve balanced load distribution.

Load distribution among multiple generators: The EMS optimizes fuel usage by automatically starting and stopping gensets based on load demand. The EMS prioritizes generator start and stop according to cumulative operating hours to ensure balanced runtime across all units. Each genset must be equipped with speed governing, voltage regulation, and circuit breaker synchronization interfaces to enable parallel operation with load sharing. Automatic start-stop function must be implemented through dedicated generator controllers. Existing controllers lacking this capability require replacement to achieve system compliance.

9 TYPICAL APPLICATION

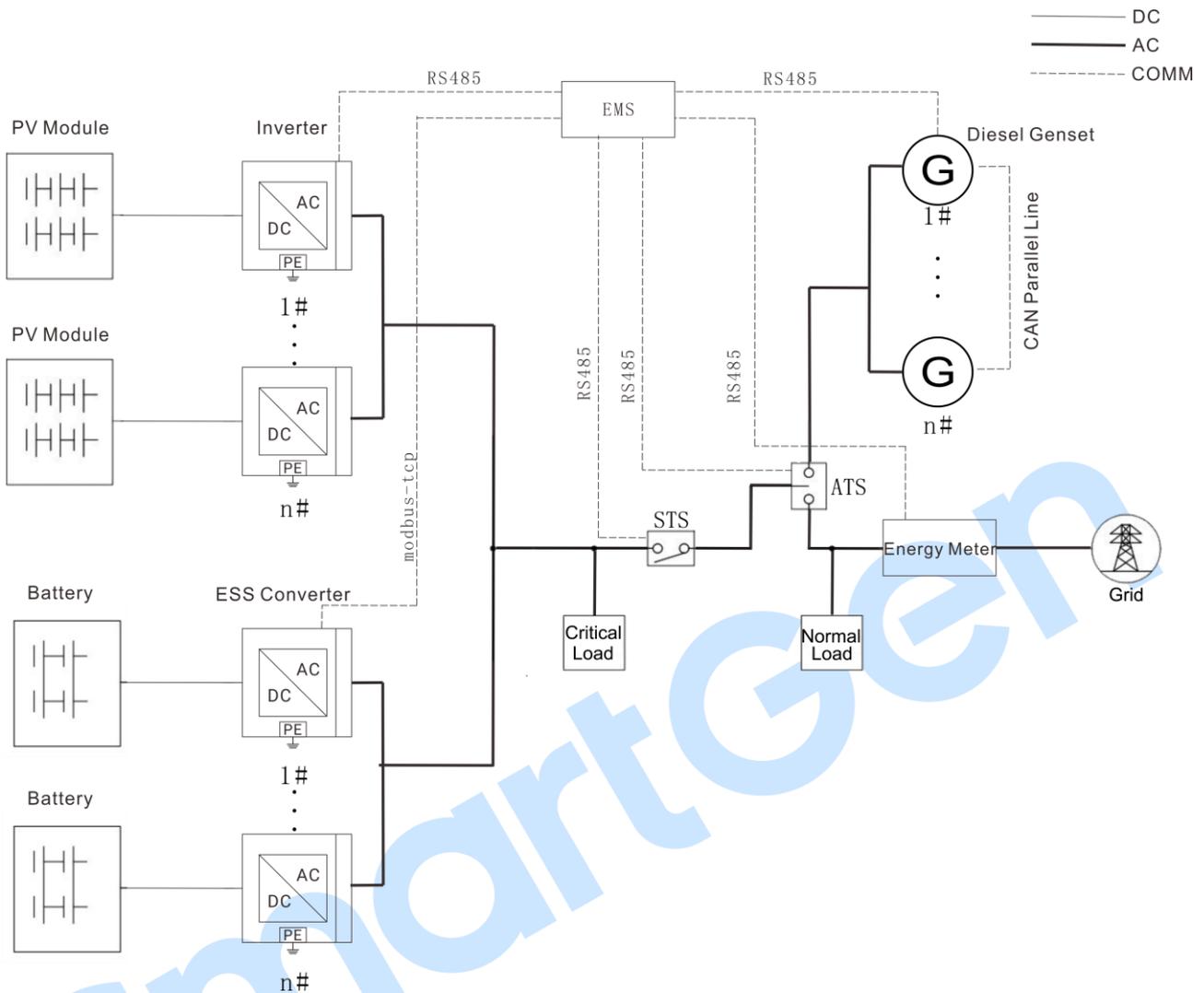


Fig.2 Typical Application Diagram

10 CLOUD PLATFORM

The cloud platform can display the information overview of all energy storage sites across the country through a large-screen map, realizing the overall distribution of all energy storage stations and the statistical functions of important business data. Specifically include the following:

- Basic data such as project numbers and maps  
The number of hybrid energy stations and the location of the longitude and latitude of the station are displayed, and the EMS access network of the corresponding station is added to realize detailed data viewing and setting.
- Energy storage revenue display  
Display the power and revenue data of all energy storage power stations on this platform.
- Charge and discharge efficiency display  
Display the total charge and discharge capacity, efficiency and other data of all energy storage power stations on this platform.
- Site alarm and equipment alarm

Display the station alarm situation in the system and the alarm information in all energy storage stations.

- Hybrid energy control strategy issuance

Support the control and strategy issuance of commercial energy storage, PV + energy storage, PV + energy storage + diesel genset, PV + energy storage + charging piles.

## 11 TERMINAL DEFINITION

### 11.1 POWER INTERFACE

The whole HEMS150 is powered by DC power supply, please use it with a suitable power supply. The physical form of the interface is a green socket with 3Pin and a distance of 3.81mm. The socket has its own screw hole, as shown in the table below.

**Table 4 Pin Definition of Power Interface**

PIN	Name	Design No.	Note
1	Power Supply	9V-36V	System power input
2	Protection Ground	EARTH	Ground/shell ground
3	Power Ground	GND	Power ground

### 11.2 DO INTERFACE

HEMS150 provides 6-way relay isolation DOs, 4-way high-side drive DOs, and 2-way low-side drive DOs, which can be used to control the power on and off of external devices or as switches. The following table describes the DO interface signal.

**Table 5 Passive DO Interface**

PIN	Name	Note
1	DO1	Mechanical relay isolation, maximum switching voltage 250VAC/25VDC, maximum switching current 4A, minimum load 5VDC 10mA
2	DO2	Mechanical relay isolation, maximum switching voltage 250VAC/25VDC, maximum switching current 4A, minimum load 5VDC 10mA
3	DO3	Mechanical relay isolation, maximum switching voltage 250VAC/25VDC, maximum switching current 4A, minimum load 5VDC 10mA
4	DO4	Mechanical relay isolation, maximum switching voltage 250VAC/25VDC, maximum switching current 4A, minimum load 5VDC 10mA
5	DO5	Solid-state relay isolation, maximum switching voltage 24VDC, maximum switching current 0.25A
6	DO6	Solid-state relay isolation, maximum switching voltage 24VDC, maximum switching current 0.25A

**Table 6 High-low Side Drive DO Interface**

PIN	Name	Note
1	VCC	High and low side drive power supply, input voltage (9~36)VDC
2	LSD1-	Low-side drive channel 1
3	LSD2-	Low-side drive channel 2
4	GND	Power ground of high-low side drive

PIN	Name	Note
5	HSD1+	High-side drive channel 1
6	HSD2+	High-side drive channel 2
7	HSD3+	High-side drive channel 3
8	HSD4+	High-side drive channel 4

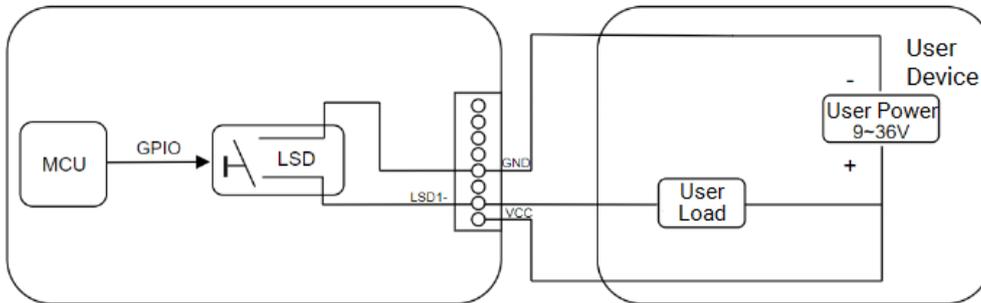


Fig.3 Control Principle Diagram of Low-side Drive

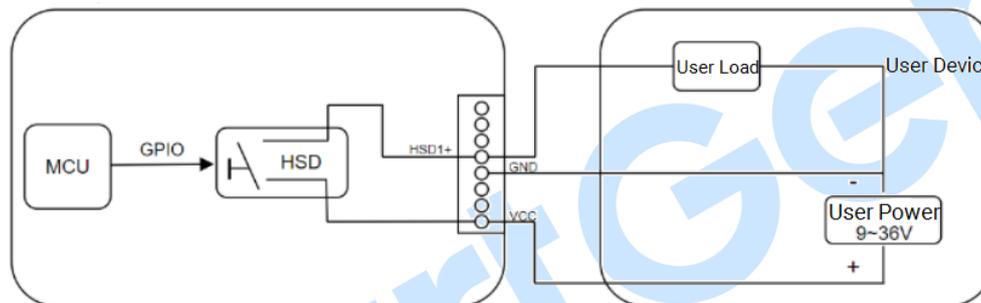


Fig.4 Control Principle Diagram of High-side Drive

### 11.3 DI INTERFACE

HEMS150 provides 8-way optocoupler isolated DI interfaces, including 4 wet contact DI and 4 dry contact DI. The interface pin definitions are shown in the table.

Table 7 DI Interface Signal

PIN	Name	Function	Note
1	HDI1+	High active input+	Opto-coupler isolation, wet contact, (9~24)V high active input
2	HDI1-	High active input-	Opto-coupler isolation, wet contact, reference ground input
3	HDI2+	High active input+	Opto-coupler isolation, wet contact, (9~24)V high active input
4	HDI2-	High active input-	Opto-coupler isolation, wet contact, reference ground input
5	HDI3+	High active input+	Opto-coupler isolation, wet contact, (9~24)V high active input
6	HDI3-	High active input-	Opto-coupler isolation, wet contact, reference ground input
7	HDI4+	High active input+	Opto-coupler isolation, wet contact, (9~24)V high active input

PIN	Name	Function	Note
8	HDI4-	High active input-	Opto-coupler isolation, wet contact, reference ground input
9	LDI1	Low active input	Opto-coupler isolation, dry contact
10	LDI2	Low active input	Opto-coupler isolation, dry contact
11	LDI3	Low active input	Opto-coupler isolation, dry contact
12	LDI4	Low active input	Opto-coupler isolation, dry contact

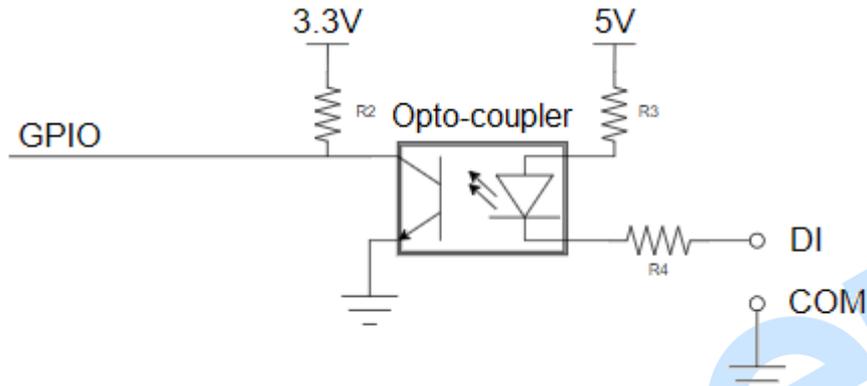


Fig.5 Circuit Principle Diagram of Dry Contact DI

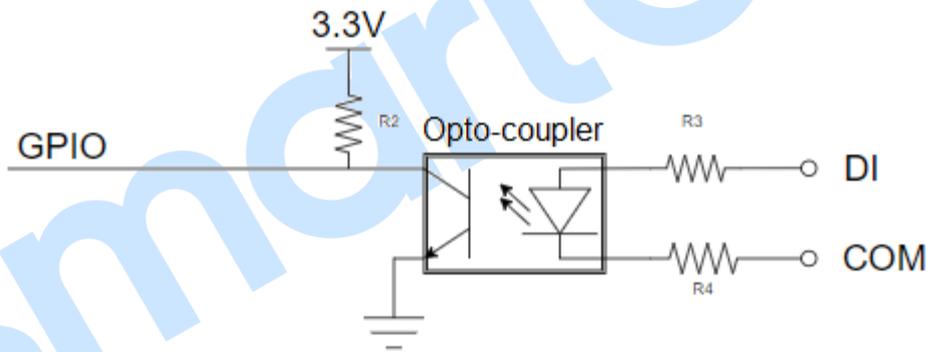


Fig.6 Circuit Principle Diagram of Wet Contact DI

11.4 CAN INTERFACE

HEMS150 has 2-way isolated CAN interfaces and supports CAN-FD, as shown in the following table.

Table 8 Pin Definition of CAN Interface

PIN	Name	Signal	Note
1	CANH1	H1	Support CAN-FD
2	CANL1	L1	Support CAN-FD
3	CANG1	G1	CAN1 shielded ground
4	CANH2	H2	Support CAN-FD
5	CANL2	L2	Support CAN-FD
6	CANG2	G2	CAN2 shielded ground

**11.5 RS-485 INTERFACE**

HEMS150 provides 6-way isolated RS-485 interfaces, and the 6th RS-485 supports RS232.

**Table 9 Pin Signal Definition of RS-485**

PIN	Name	Design No.	Note
1	485A1	A1	Isolation
2	485B1	B1	Isolation
3	485G1	G1	Shielded ground
4	485A2	A2	Isolation
5	485B2	B2	Isolation
6	485G2	G2	Shielded ground
7	485A3	A3	Isolation
8	485B3	B3	Isolation
9	485G3	G3	Shielded ground
10	485A4	A4	Isolation
11	485B4	B4	Isolation
12	485G4	G4	Shielded ground
13	485A5	A5	Isolation
14	485B5	B5	Isolation
15	485G5	G5	Shielded ground
16	A6/TX	A6/TX	Isolation, RS485/RS232 software can be selected for this channel
17	B6/RX	B6/RX	Isolation, RS485/RS232 software can be selected for this channel
18	RGND	RGND	Isolation, RS485/RS232 software can be selected for this channel

**11.6 RS-232 DEBUGGING INTERFACE**

HEMS150 provides 1-way RS-232 debugging serial port, using DB9 female socket, and the interface is a system debugging interface. Use a serial extension cable or USB to serial cable to connect to the computer, open the serial debugging tool, you can see the system startup information and debugging information in the debugging tool, which is convenient for grasping the system state. The default format of the serial port is baud rate 115200bps, 8-bit data bit, 1-bit stop bit, and no parity. Please see the table below for details.

**Table 10 Pin Description of RS-232 Communication Interface**

PIN	Name	Design No.	Note
2	TXD	TXD	Send
3	RXD	RXD	Receive
5	GND	GND	Ground

**11.7 ETHERNET INTERFACE**

HEMS150 provides 2-way Ethernet interface, the interface uses RJ45 socket, 10Mbps/100Mbps/1000Mbps adaptive. There are two LEDs on each socket, and the distribution of network numbers is shown in the table below.

**Table 11 Channel Description**

PIN	Name	Design No.	Note
1	Network Port 1	NET1	Gigabit Ethernet
2	Network Port 2	NET2	Gigabit Ethernet

**11.8 KEY**

HEMS150 provides 1 system reset key and 1 default key. The key function description is shown in the following table.

**Table 12 Key Description**

PIN	Name	Function	Note
1	RESET	System reset	Hidden type
2	DEFAULT	(To be developed)	Hidden type

**11.9 USB DOUBLE-LAYER SOCKET**

HEMS150 provides 2-way USB2.0 interfaces, which are extended from the main USB1 through the USB Hub chip, and can be used to connect USB disk, USB mouse, USB keyboard and other devices.

**Table 13 USB Double-layer Socket**

PIN	Name	Design No.	Note
1	USB2.0	USB1	Processor USB1 Expanded by USB Hub
2	USB2.0	USB2	

**11.10 SIM CARD SOCKET**

HEMS150 provides 1-way miniPCIE interface, mainly used to expand the use of 4G wireless module, the external interface of the device provides 1-way standard SIM large card slot for inserting the operator's standard SIM card in order to provide networking capabilities, the specific operator selection is related to the selected miniPCIE 4G module.

**11.11 SD CARD SOCKET**

HEMS150 provides 1-way SD card standard socket. The SD card can be used for system debugging, firmware burning, start and upgrade. After the system starting, the user can read and write the SD card normally.

**11.12 ANTENNA INTERFACE**

HEMS150 provides 2-way antenna interfaces, ANT1 interface is used with miniPCIE slot. When the 4G module is inserted into the miniPCIE slot, a 4G antenna needs to be connected to the ANT1 interface, and the external 4G antenna interface needs to be SMA inner pin. If the 4G module is not used, the ANT1 interface can be suspended. The ANT2 interface is an internal WIFI/BT antenna interface. When using the WIFI/BT function of the device, an external 2.4G antenna needs to be connected to the ANT2 interface, and the antenna interface is also an SMA inner pin.



**Fig.7 External Antenna Interface (SMA Inner Pin)**

**11.13 miniPCIE INTERFACE**

HEMS150 provides 1-way miniPCIE expansion interface with internal 4G module to support wireless communication. A standard SIM card holder is preset on the board, which can be used to insert a standard SIM card.

**11.14 INDICATORS**

There are 8 indicators in HEMS150, namely power indicator, running indicator, error indicator, hard disk indicator and 4 programmable indicators, which are convenient for understanding the operation status of the system in any case, as described in the table below.

**Table 14 Indicator Description**

PIN	Name	Design No.	Note
1	Power Indicator, Red	PWR	Light on: Normal power-on Light off: Power outage
2	Running Indicator, Green	RUN	Flash: Normal running Light on/off: System crashing
3	Error Indicator, Red	ERR	Light on: Running error Light off: Normal running
4	Wireless Module Indicator, Green	STA	Slow flash (on 200ms and off 1800ms): networking status, registration failed Fast flash (on 234ms and off 266ms): successful registration, standby state Quick flash (on 63ms and off 62ms): data transmission mode Always on: On call

Unit: mm

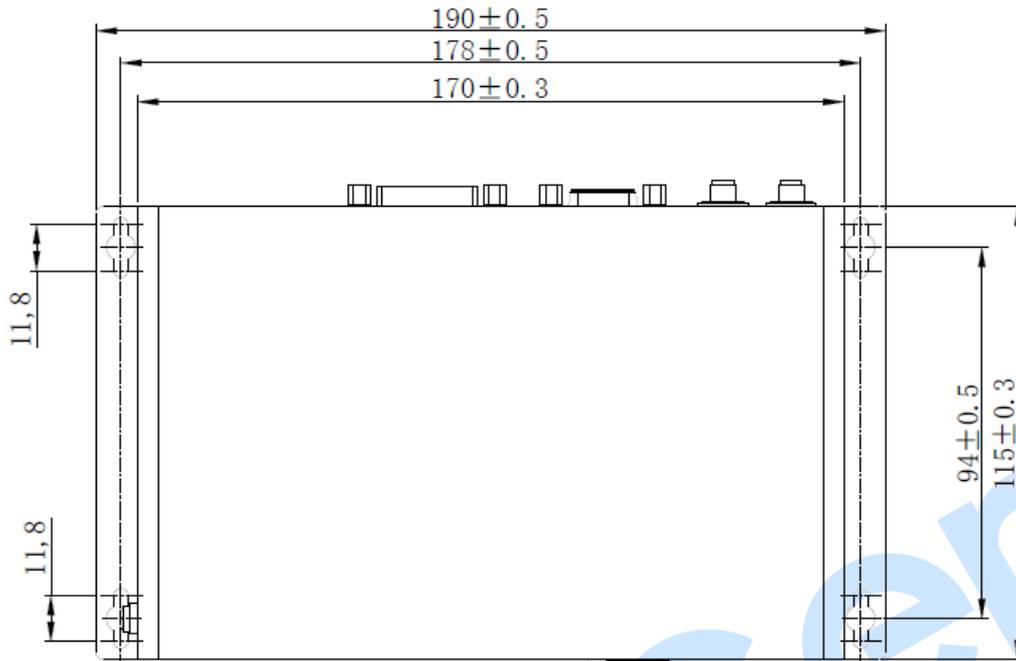


Fig.8 Mounting Hole Installation and Dimensions

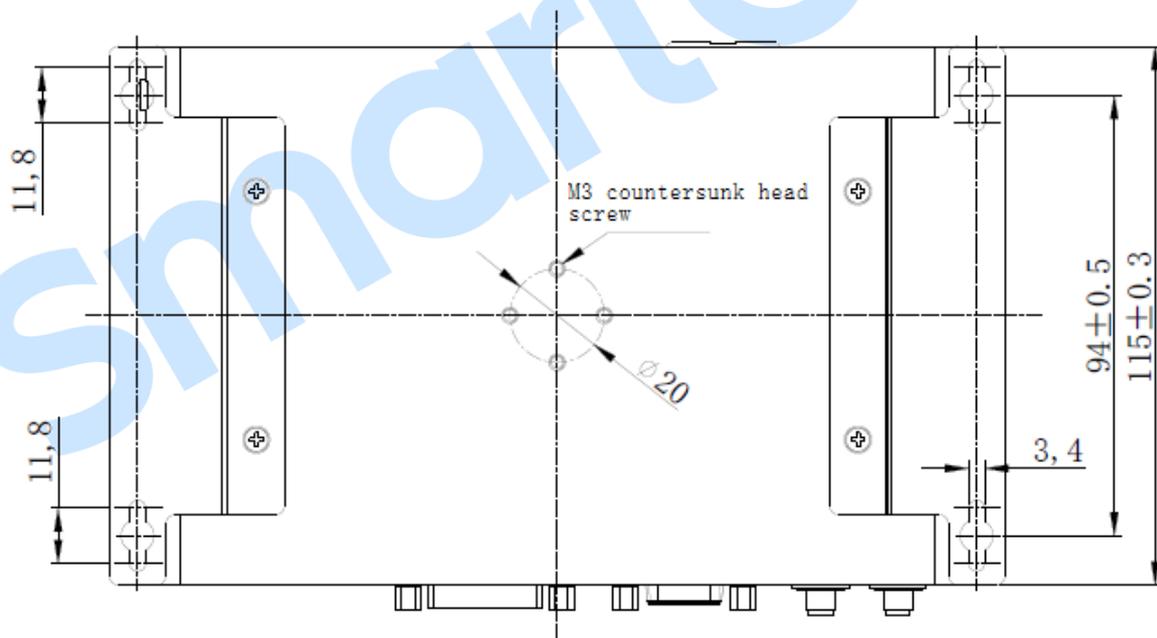
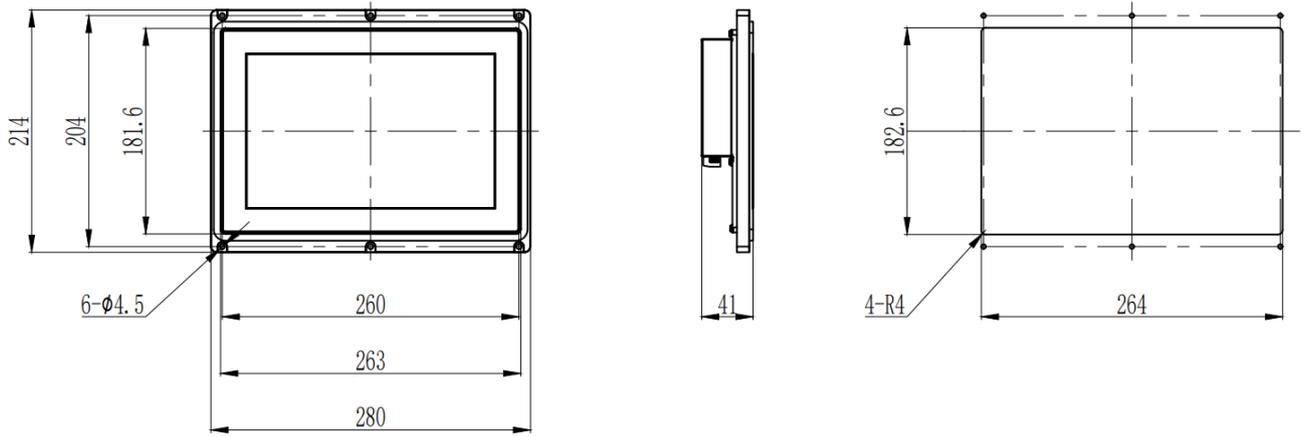


Fig.9 Guiderail Installation Position Diagram



(a) Overall Dimensions

(b) Recommended Cutout Size

Fig.10 Overall Dimensions and Recommended Cutout Size of 10.1-inch Screen

**12 COMMISSIONING**

Before running, the following checks are recommended:

- Check that all wirings are correct and the wire diameter is appropriate;
- Test whether each device is running and whether the uploaded data is correct;

If you have any other questions, please contact the service personnel of the company in time.

**13 OPTIONAL ACCESSORY**

**Table 15 Optional Accessory**

Accessory	Name
Display Screen	10.1-inch screen